FORAGE INTAKE AND NUTRIENT INTAKE BY STEERS GRAZING TALLGRASS PRAIRIE AT DIFFERENT FORAGE ALLOWANCES

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Story in Brief

In each of three 10-day trials, steers were placed on pasture with daily forage allowances of 22, 44, 66, or 88 lb of dry matter/animal unit day. Significant differences among trials (mid-May, late June, mid-August) were noted for crude protein and digestible organic matter content of diet samples, daily forage intake, and daily nutrient intake. Forage allowance did not influence nutrient composition of the diets. However, forage allowance did have significant impacts on daily forage intake, digestible organic matter intake and crude protein intake. Fecal output was lower on the 22 and 44 lb/animal unit day allowances than on the two higher allowances. This difference suggests that forage availability limited intake at the two lower allowances. Total daily forage intake was reduced about 6% and daily digestible energy intake was reduced about 9% at the 22 and 44 lb/animal unit day allowances.

(Key Words: Forage Intake, Forage Allowance, Grazing, Cattle, Range.)

Introduction

Interest in improving the efficiency of forage utilization and livestock production from rangelands has increased the study of intensified grazing management programs. In several areas of the United States, researchers have studied one-herd, multipasture rotational grazing systems. However, research in the tallgrass prairie has focused on intensive-early stocking (IES) systems. Although IES programs increase beef production efficiency (lb gain/acre), they are based on continuous grazing during a shortened grazing season. Development of intensive rotational grazing management programs could improve production efficiency while complementing IES by allowing for extended grazing seasons.

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Keys to successful implementation of rotational grazing are proper timing of plant defoliation to maintain plant vigor and proper forage allocation to maintain livestock performance. The study described below was designed to determine the influence of varied forage allowances on nutrient intake by cattle at three periods during the summer grazing season.

Materials and Methods

The study was conducted near Stillwater, OK, on a claypan prairie range site. During the study year, big bluestem, little bluestem and indiangrass accounted for over 75% of the forage production at this site.

Three 10-day trials were conducted during the grazing season. Trial conditions are described in Table 1. The trials were purposely spread across the growing season in order to test interactions among forage conditions and forage allowances. Within each trial, beef steers were placed in pastures of varied size in order to attain daily forage allowances of 22, 44, 66, and 88 lb/animal unit day (AUD). Each forage allowance was replicated twice. The forage allowances were characteristic of allowances in 16-32 paddock grazing systems stocked at a moderate rate or an 8 paddock system with stocking rate increased significantly.

During each trial, fecal output of three steers in each pasture replicate was estimated using chromic oxide as an external marker. The marker was administered daily at 7:00 a.m. Fecal samples were collected twice daily from each steer. Diet nutrient composition was monitored by collecting masticate samples from each pasture daily with three esophageally fistulated steers.

Table 1. Tallgrass prairie range site conditions.

	Trial		
	1	2	3
Date	May 15-25	July 2-12	August 12-22
Steer weight, lb	594	671	781
Standing crop, lb/ac	965	2608	3646
Diet, Day 1			
CP, %	11	8	7
IVOMD, %	60	55	53

Table 2. Effects of trial and forage allowance on diet composition and forage intake.

		Trial			Forage allowance			
		May	July	August	22	44	66	88
Diet, %								
	CP	9.9[a]	7.7[b]	6.8[c]	8.4	8.0	8.2	7.9
	DOM	57.5[a]	54.1[b]	48.3[c]	52.5	52.8	54.0	53.8
Fecal output, lb/day		1.22[a]	.89[b]	.82[c]	.95[a]	.96[a]	1.00[b]	1.00[b]
Daily intake, lb/100 lb BW								
	OM	2.87[a]	1.96[b]	1.59[c]	2.11[a]	2.72[a]	2.22[b]	2.25[b]
	DOM	1.65[a]	1.06[b]	.77[c]	1.11[a]	1.12[a]	1.20[b]	1.21[b]

[a,b,c] Row and column means with different superscripts are different ($P<.05$).

Diet samples were analyzed for crude protein and in vitro digestibility. Forage intake was calculated from the ratio of fecal output and diet indigestibility. All values were adjusted to an organic matter basis.

Results and Discussion

No interactions ($P>.05$) among trial and forage allowance were detected. The lack of interaction indicates that forage allowance affected cattle nutrition in a similar manner regardless of forage conditions. Trial means and forage allowance means are presented in Table 2.

All nutritional responses declined ($P<.0001$) as the grazing season progressed. Diet crude protein (CP) and digestibile organic matter (DOM) reflect the seasonal decline noted in previous studies in the Stillwater area. Forage intake during Trial 1 is higher than noted in previous trials conducted in May. The higher intake reflects compensatory forage intake by the steers following a winter period on a low plane of nutrition. The intake values in Trials 2 and 3 are similar to intakes observed in other trials conducted at similar periods on similar rangeland.

Forage allowance did not significantly ($P>.15$) impact nutrient composition of the diets. Diet CP tended to increase as forage allowance was reduced. In contrast, DOM in the diet tended to be higher at the more liberal forage allowances.

Forage intake (lb OM/day) decreased in a linear manner ($P<.01$) as forage allowance was reduced. Further analysis revealed there were no differences between the two higher allowances or the two lower allowances. The difference between the high and low treatments represents a 6.3% reduction in daily intake. The reduction in intake is the result of both diet digestibility and reduced fecal output. Fecal output was 4.7% lower ($P<.01$) on the 22 and 44 lb/AUD allowance compared to the higher allowances. A reduction in fecal output suggests that forage availability limited daily forage intake. Intake of DOM also declined in a linear manner ($P<.01$) as forage allowance decreased. Once again, the primary difference occurred as allowance fell below 66 lb/AUD and as a result digestible energy intake was 9.1% lower at the 22 and 44 lb/AUD allowances.

The forage allowances tested in these trials are much lower than allowances that occur under continuous grazing but are similar to allowances that would be encountered in a multipasture, single herd grazing system. Under the conditions of our trials, forage allowance did not have a significant impact on diet nutritive value. But forage intake and digestible energy intake were reduced as forage allowance fell below 66 lb/AUD. Our data suggest that livestock performance will be reduced almost 10% on intensive rotation grazing systems which allocate less than 66 lb/AUD.